VI. CARBONIFEROUS INSECTS FROM PENNSYLVANIA IN THE CARNEGIE MUSEUM AND THE MUSEUM OF COMPARATIVE ZOOLOGY.

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Museum of Comparative Zoology.

The extensive coal beds of Pennsylvania have produced a surprisingly small number of insects. Up to the present time only 45 species have been described, although more than 80 have been found in the neighboring and more restricted coal beds of West Virginia. The present paper, which I hope is but one of a series on the fossil insects of Pennsylvania, is based upon a relatively large assemblage of specimens in the Carnegie Museum and a few others of unusual interest in the Museum of Comparative Zoology. For the opportunity of studying the Carnegie collection I am indebted to the authorities of the Carnegie Museum, especially Dr. I. P. Tolmachoff.

These new Carboniferous insects are referable to two orders: *Protorthoptera*, with 4 specimens; and *Blattariae*, with 44 specimens. The cockroaches are members of four families, *Archimylacridae* (30 specimens), *Spiloblattinidae* (3 specimens), *Mylacridae* (10 specimens), and *Mesoblattidae* (1 specimen). It is interesting to compare with this collection the insects which have previously been described from the Pennsylvania coal beds. The latter belong to the following orders: *Palaeodictyoptera* (3 specimens), *Protodonata* (1 specimen), *Hapaloptéroidea* (1 specimen), *Protorthoptera* (1 specimen), and *Blattariae* (39 specimens). The cockroaches represented 5 families: *Archimylacridae* (11 specimens), *Mylacridae* (23 specimens), *Neomylacridae* (3 specimens), *Pteridomylacridae* (1 specimen), and *Idiomylacridae* (1 specimen). It is therefore apparent that the new material described in this paper adds considerable to our knowledge of the fauna of the region, for two of the families of *Blattariae*, the *Spiloblatinidae*, and *Mesoblattidae*, have not previously been found there. It is peculiar that although the Mylacrids are twice as abundant as the Archimylacridae among the previously described fossils, the latter are three times as numerous as the Mylacridae in the new material.

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The localities and horizons at which the fossils described below were collected are as follows:

1. South Good Spring Colliery, 4 miles west of Tremont, Pennsylvania; Mammoth coal vein. Freeport stage of Allegheny formation. The specimens from this locality were collected by W. Victor Lehman and purchased by the Carnegie Museum in 1910 (Collection No. 4032).

2. Swatara Gap, Sharp Mountain, near Tremont, Pennsylvania; Buck Mt. coal. Clarion stage of Allegheny formation. Collected by W. Victor Lehman and purchased by the Carnegie Museum in 1910 (Collection No. 4032).

3. Brookville, Pennsylvania. Mercer group (Appalachian).

4. Pittsburgh, Pennsylvania; Duquesne Shale, Brilliant cutoff. Conemaugh formation. Collected by J. J. Burke (Carnegie Museum Collection No. 9266).

5. Pittsburgh, Pennsylvania. Duquesne coal, Junction hollow, Schenley Park. Conemaugh formation. Collected by J. J. Burke (Carnegie Museum Collection No. 9266).

6. Samples, Pennsylvania; Mason Shales. Conemaugh formation. Collected by P. E. Raymond (Carnegie Museum Collection No. 9272).

7. Aspinwall, Pennsylvania, west side of Allegheny River. Conemaugh formation. Collected by Alfred Emerson.

All of the localities, with the possible exception of Swatara Gap, are new as sources of fossil insects, although the Mammoth vein of coal has already yielded several specimens at other exposures. The South Good Spring Colliery seems to be the most promising locality for further collecting of insects, and probably deserves exploitation for this purpose.

Order **PROTORTHOPTERA.**

Three of the four specimens of this order are sufficiently well preserved to warrant description; the fourth is but a fragment of the middle of a wing and does not show even family relationships.

Family CALONEURIDAE.

CALONEURELLA, gen. nov.

Sc terminating just before the apex of the wing; Rs arising at about the middle of the wing, with three terminal branches; M forked

dichotomously proximad of the origin of R4+5; CuA and CuP very close together. The proximal half of the wing is unknown.

Genotype: *Caloneurella carbonaria*, sp. nov.

For a proper appreciation of the systematic position of the new genus and certain allied species the following considerations might be of interest.

The closest relatives of this interesting insect are the *Caloneuridæ* from the Carboniferous of Commentry (France) and a series of undescribed fossils from the Lower Permian of Kansas. The latter fossils, which are abundantly represented in the Museum of Comparative Zoology, are decidedly closer to *Caloneurella* than the Commentry fossils. All of these insects are distinguished by two outstanding features of the wings: the proximity of CuA and CuP, the former being an extraordinarily convex vein; and the abundance and strength of the cross-veins, all of which are decidedly convex, giving the wing the appearance of having numerous short wrinkles. In one of the undescribed species from the Kansas Permian the cross-veins are much thicker and heavier than the longitudinal veins.

Since the Carboniferous members of this aggregation of insects are not nearly so well preserved as those from the Permian of Kansas, the discussion of their affinities will be reserved for a later paper dealing with the Kansas material. At present, however, I wish to call attention to certain discrepancies in the accounts of the *Caloneuridae* of Commentry which have made the affinities of the group somewhat uncertain. The following is a list of these insects:

Caloneura dawsoni Brongniart.[1] In this species Rs has at least five terminal branches. Handlirsch (1919) has made several other species from the specimens which Brongniart named *C. dawsoni*. The photographs in figures 5 and 7 of Brongniart's 1894 paper show clearly the strongly convex cross-veins and the wrinkled appearance of the wing.

Caloneura subtilis Bolton.[2] This fossil shows so little of the media and cubitus that its assignment even to the family Caloneuridae is doubtful.

[1]Brongniart, 1885, Bull. Soc. Rouen, **21**: 59, pl. 4, fig. 2; 1894, Insectes des temps primaires, p. 562, pl. 52, figs. 5-11. Handlirsch, 1906, Foss. Ins., p. 141, pl. 14, fig. 13; 1919, Denkschr. Akad. Wiss. Wien Kl. **96**: 36, fig. 36. Lameere, 1917, Bull. Mus. Paris, **23**: 181. Bolton, 1925, Foss. Ins. Brit. Mus., p. 15, fig. 5.

[2]Bolton, 1925, Foss. Ins. Brit. Mus., p. 16, fig. 6.

Homaloptila similis (Meunier).[3] In their figures of this fossil, both Meunier and Handlirsch depict Rs with three terminal branches; Lameere, however, states that CuA is included in Meunier's media. Since Meunier shows the media as consisting of only two branches, this statement of Lameere's indicates that M is an unbranched vein. Handlirsch depicts the media as a forked vein, though he was uncertain of the position of some veins in the wing.

Confusio royeri (Meunier).[4] Meunier figured this wing with five branches leading from Rs, but Lameere states that there are six. Lameere also contends that the last branch of the media of Meunier's figure is CuA, and the second cubitus of Meunier is 1A. Meunier shows the fork of M almost at midwing, and this is verified by the photograph given by Meunier. Handlirsch depicts Rs with six branches, but he has the media dividing much nearer the base of the wing than is shown in the photograph. According to Lameere the basal part of the wing is narrow, not broad as figured by Meunier. This view of Lameere's agrees with the structure of the Kansas Permian species, in which the wings are decidedly narrowed at the base.

Pruvostilla lecomtei (Pruvost).[5] In this wing Rs has 3 terminal branches, although more may have been present in the distal part of the wing, which is missing. The media divides at the base of the wing.

From the foregoing account it is apparent that some of the Commentry fossils, especially *C. royeri*, need to be studied further to settle if possible the diverse opinions regarding the structure of Rs and M. It is clear, however, that all these wings have in common the proximity of CuA and CuP, and the numerous, convex cross-veins.

Caloneurella carbonaria, sp. nov. Fig. 1; Plate XXIV, Fig. 2.

Length of preserved part of wing, 15 mm.; estimated length, 45 mm.; width, 7 mm.; costal space broader than the subcostal; Rs dividing at a point well beyond the middle of the wing into R2, R3,

[3]Meunier, 1911, Bull. Mus. H. Nat., **27**: 118, fig. 1; 1912, Ann. Palaeont., **7**: 8, pl. 6, fig. 5; Lameere, 1917, Bull. Mus. H. Nat., **23**: 181. Handlirsch, 1919, Denkschr. Akad. Wiss. Wien Kl. **96**: 36, fig. 42-43.

[4]Meunier, 1911, Bull. Mus. H. Nat., **17**: 119, fig. 2; 1912, Ann. Palaeont., **7**: 9, pl. 7, fig. 2. Lameere, 1917, Bull. Mus. H. Nat., **23**: 181. Handlirsch, 1919, Denkschr. Akad. Wiss. Wien Kl. **96**: 37, fig. 44.

[5]Pruvost, 1919, Faune cont. houill. N. Fr., 115, pl. 15, fig. 1, 2. Handlirsch, 1921, Foss. cat., Ins. Palaeoz., 82.

R4+5; M with two terminal branches, the anterior one directed anteriorly after its origin; CuA with a distinct fork near the margin of the wing. Cross-veins very strong and numerous; along the apical

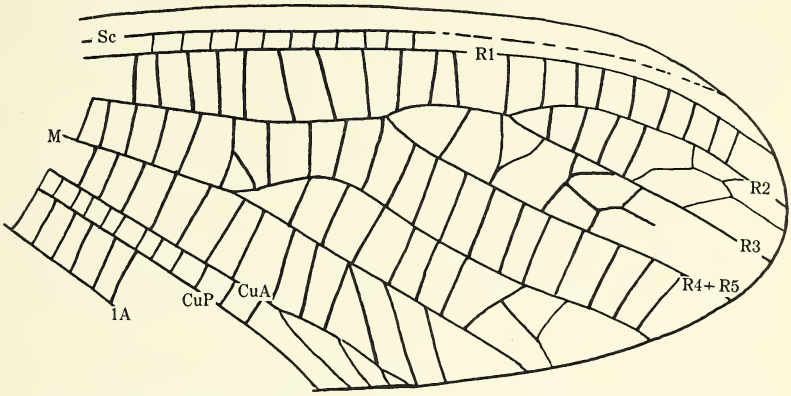

FIG. 1. *Caloneurella carbonaria*, sp. nov., fore wing; drawn from holotype.

area and posterior border there is a coarse network formed by the branching of the cross-veins.

Holotype: Carnegie Museum No. 6894 and 6895. Locality: Mammoth Vein; South Good Spring Colliery; Freeport Stage (Allegheny). The specimen consists of the distal third of a very finely preserved wing.

Family PALAEOCIXIIDAE.

FABRECIELLA, gen. nov.

Allied to *Fabrecia*. Sc terminating on the costal margin before the apex of the wing; costal space broad, traversed by numerous oblique cross-veins; R1 unbranched; Rs arising proximad of mid-wing, with 4 terminal branches; M dividing at very base into MA and MP; MA with 2 branches; MP with 2-4 branches, CuA forked, the posterior branch (CuA2) simple, the anterior one (CuA1) with a series of four short terminal branches leading to the posterior margin.

The new genus Fabreciella is obviously very close to *Fabrecia* Meunier and *Palaeocixius* Brongniart, from the Carboniferous of Commentry.[6] It differs from these two genera in the possession of a much broader costal space, and in the arrangement of the branches of

[6]For description of these fossils see Brongniart (1893), Meunier (1911, 1912), Lameere (1917) and Handlirsch (1919).

MA and MP. This is the first occurrence of the family *Palaeocixiidae* in the Carboniferous rocks of the New World, although several related undescribed species have been found in the Lower Permian of Kansas. Since the latter are more completely preserved, I shall reserve discussion of the affinities of the *Palaeocixiidae* for the paper dealing with the Kansas fossils.

Genotype: *Fabreciella pennsylvanica*, sp. nov.

Fabreciella pennsylvanica, sp. nov. Fig. 2.

Fore wing: Length of preserved part, 17 mm.; width, 5 mm.; apex rounded; Rs with branches R2, R3a, R3b, R4+5; MA dividing distad of first fork of Rs; MP with 4 branches, dividing before first fork in Rs with branches MP1, MP2, MP3, MP4; CuP remote from

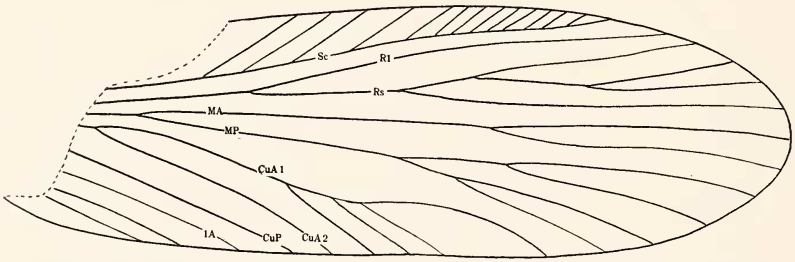

FIG. 2. *Fabreciella pennsylvanica*, sp. nov., fore wing; drawn from holotype.

CuA2; anal veins straight and parallel. The entire wing is coriaceous, with numerous reticulated cells, strongest apically.

Holotype: Carnegie Museum, No. 6896. Locality: South Good Spring Colliery, Mammoth vein; Freeport stage of Allegheny formation. The specimen is very well preserved and lacks only the basal part.

Fabreciella allegheniensis, sp. nov. Fig. 3.

Fore wing: Length of preserved part, 12 mm.; width 5 mm.; estimated whole length, 20 mm.; Rs with branches R2, R3, R4, R5; MA and MP dividing at the same level, at a point distad of the first fork of Rs; CuA shaped as in *F. pennsylvanica*. Basal part of wing unknown.

The species is close to the preceding and I believe it almost certainly belongs to the same genus, although that cannot be determined definitely until the basal portion of the wing is known. The venation

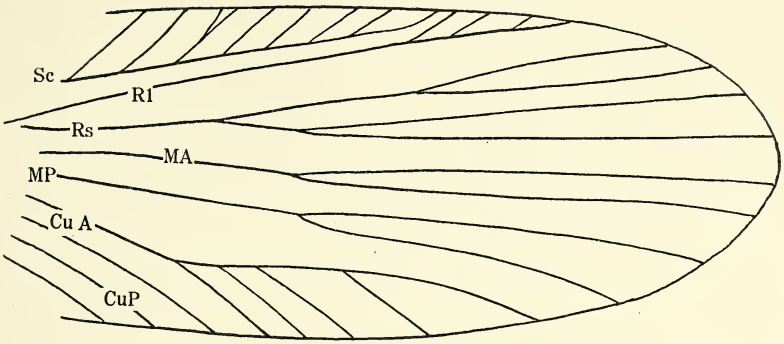

FIG. 3. *Fabreciella allegheniensis*, sp. nov.; fore wing; drawn from holotype.

differs from that of the foregoing by the arrangement of the branches of Rs, and by having only two branches on MP instead of four.

Holotype: Carnegie Museum, No. 6897. Locality: South Good Spring Colliery, Mammoth vein; Freeport stage of Allegheny formation. This specimen consists of the distal half of a well preserved wing.

Order **BLATTARIAE.**

The most striking feature of the Carboniferous insect fauna is the extraordinary abundance of cockroaches, which comprise about 60% of the species of that period. Since most of these consist of single fore wings or tegmina, the classification of this extensive series of insects has been a perplexing problem. The earlier investigators on fossil cockroaches attempted to classify them on such characteristics as the distinctiveness of the venation and the shape of the cellules, but these of course were only individual traits, as shown by Scudder. The latter made an exhaustive inquiry into the classification of fossil cockroaches and proposed to separate the Palaeozoic species from the later ones by placing them in a separate family, *Palaeoblattinidae*. This family was divided into two "tribes," *Mylacridae* and *Blattinariae*, based mainly on the formation of the subcosta. As Handlirsch demonstrated later (1906), Scudder's conception of the evolution of the tegmen of the roaches was quite erroneous, but the characteristics on which he divided the *Palaeoblattinidae* were apparently sound. In his latest work on Palaeozoic cockroaches (1920) Handlirsch recog-

nizes eleven families, of which three, *Archimylacridae*, *Spiloblattinidae*, and *Mylacridae*, include 75 per cent of the species.

Although the phylogeny and fundamental classification of the Blattariae has apparently been established on a sound basis, the lines of demarcation between genera, species, and individuals are still not clear. This is primarily due to the fact that the venation of the roach tegmen is very variable, to such an extent that even the right and left wings of the same specimen usually have a different arrangement of the branches of the main veins. The taxonomy of fossil cockroaches, which consist mainly of tegmina, is therefore rendered especially confusing. I believe that in the past the tendency has been to base species upon individual traits only; this conclusion is substantiated by the fact that with very few exceptions the eight hundred or more species of Carboniferous cockroaches that have been described are known only by unique specimens. Scudder thought that this latter condition itself was indicative of the enormous number of species of cockroaches that existed during the Carboniferous, arguing that since each species was known only by a single specimen, petrifaction of the insects must have been a rare event; and in that case a large number of species would necessarily have existed in order to produce so many species in the fossil state. A very different view is held by Bolton (1925) who concludes that among the Carboniferous cockroaches "species, as such, scarcely exist, their place being taken" by what he terms *species-groups*. Just what the limits of the *species-groups* are is not clear; but at any rate I believe that in forming this concept Bolton has overlooked the fact that his conclusion was based upon variability of a single structure,—the venation of the fore wing. There are innumerable instances among the recent insects in which one structure, such as the wing venation, is subject to such extreme instability as to be almost useless for the taxonomy of the species. But in these groups other structural characteristics, such as genitalia, are constant and enable us to establish readily a specific classification. The recent cockroaches, themselves, are in this category. Hence, the variability of the venation in the Carboniferous is not sufficient to show that true species did not exist.

The present collection of cockroaches is especially interesting since it includes representatives of certain families and genera which have not been found heretofore in the coal beds of Pennsylvania, or which have not been observed before in the same horizon.

Family ARCHIMYLACRIDAE.

Of the thirty specimens belonging here, only five are sufficiently complete to enable definite generic determination; the others, although clearly *Archimylacrids*, lack certain portions of the tegmen which are essential for further classification, and I prefer to leave them unnamed rather than to add to the long list of uncertain species.

Genus APHTHOROBLATTINA Handlirsch.[7]

Aphthoroblattina handlirschi, sp. nov. (Plate XXIV, fig. 1).

Tegmen: length of preserved portion, 27 mm.; width 18 mm.; costal area very wide, traversed by numerous subcostal veinlets except at the basal part; R dividing into a distinct R1 and Rs well before the middle of wing; R1 and Rs unbranched for some distance from their origins; M arising from the stem of R at the base, not dividing until well beyond the origin of Rs; Cu joined to stem of R and M, CuP diverging posteriorly a short distance beyond the origin of M; CuA well developed, with at least six main branches; CuP deeply concave, only slightly curved; 1A remote from CuP basally but converging towards it distally. The membrane of the wing consists of the primitive archedictyon characteristic of the *Phyloblatta* group of the family. This archedictyon is clearly seen in the photograph (figure 1, plate XXIV).

I take pleasure in naming this insect for Dr. Anton Handlirsch. The type specimen is beautifully preserved, although the distal third or even half of the wing has broken away. It is one of the most generalized cockroaches which has been found, though not so primitive as *Palaeoblatta pancinerois* Scudder. The genus *Aphthoroblattina* has been known previously from 4 species, *A. fascigera* Scudder, *A. johnsoni* Woodward, *A. carbonare* Handlirsch, and *A. eggintoni* Bolton. The tegmen is incompletely known in all of these and *A. handlirschi* sp. n. shows more detail than any of the other specimens.

Holotype: No. 3345, Museum of Comparative Zoology. Locality: Brookville, Pennsylvania, Mercer group (lower Westphalian). The specimen was in the Scudder collection but probably reached him after he had discontinued active work on fossil insects.

[7]Handlirsch, 1906, Proc. U. S. Nat. Mus. **29**: 719.

Genus HEMIMYLACRELLA Handlirsch 1921.[8]

Hemimylacrella mammothi, sp. nov. Fig. 4.

Tegmen: length, 21 mm.; width, 9 mm.; costal space broad; Sc terminating at about mid-way, sending several branches to the margin; R well developed, with seven main branches, but without a definite R1; M curves away from R near mid-wing, but approaches it distally; M with 4 main branches directed posteriorly; CuA well developed, with 8 main branches; anal area missing. The archedictyon is visible in many parts of the wing.

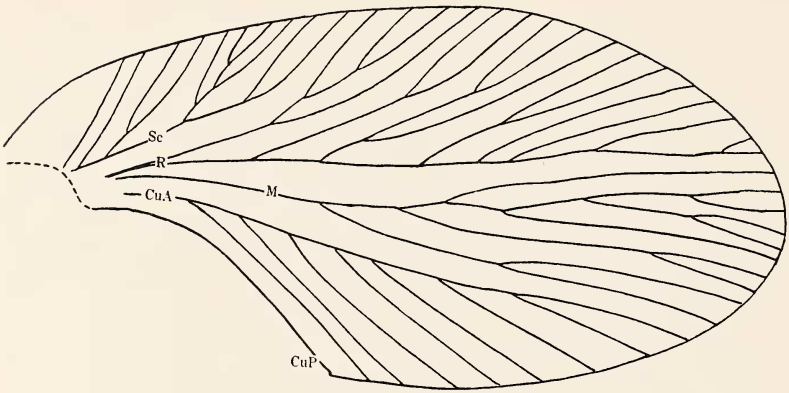

FIG. 4. *Hemimylacrella mammothi*, sp. nov.; fore wing; drawn from holotype.

The only other species of this genus is *H. ramificata* Handlirsch, from Sharp Mt. Gap, near Tremont, Pennsylvania. *H. mammothi* is very close to the genotype but differs in having the branches of Sc arranged in a definitely pectinate manner. In *H. ramificata* the branches arise almost radially, a condition which originally prompted Handlirsch to place this fossil in the *Mylacridae*. The genus *Hemimylacrella*, together with the related *Hemimylacris*, is more or less on the border line between the Archimylacridae and Mylacridae.

Holotype: Carnegie Museum, No. 6898 and 6899. Locality: South Good Spring Colliery; Freeport stage, Allegheny formation. The specimen is very well preserved, but lacks the anal area.

[8]Handlirsch, 1921, Cat. Foss., Palaeoz. Ins., p. 117.

Genus PLAGIOBLATTA Handlirsch 1906.[9]

Plagioblatta cockerelli, sp. nov. Fig. 5.

Tegmen: length 20 mm.; width, 8 mm.; slender; costal area wide; Sc terminating well beyond mid-wing; R very well developed, its first branch arising proximal of mid-wing and its last branch terminating at the very apex; M reduced, directed posteriorly almost immediately

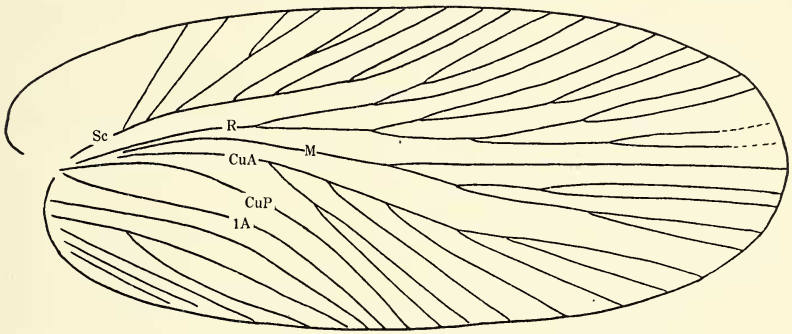

FIG. 5. *Plagioblatta cockerelli*, sp. nov., fore wing; drawn from holotype.

after its origin, forked dichotomously before mid-wing; CuA of moderate size, with 5 main branches, the first 2 branches being very long; CuP slightly curved; 1A and 2A unbranched. 3A deeply forked; anal area narrow.

This species is named for Professor T. D. A. Cockerell, who in addition to his other numerous writings on fossil insects has given us an extensive account of the Carboniferous insects of Maryland.

Plagioblatta is another genus which has previously been found in Pennsylvania, there being two species, *P. parallela* Handlirsch and *P. campbelli* Handlirsch. From both of these the present species differs by having all of the branches of Rs above the longitudinal axis of the wing, and by having a narrow anal area.

Holotype: Carnegie Museum, No. 6900. Locality: South Good Spring Colliery, Mammoth vein; Freeport stage, Allegheny formation. The type specimen is complete and well preserved. There is another specimen in the Carnegie collection (No. 6901) which seems to be another representative of the insect, though there are a few more branches on the distal part of CuA.

[9]Handlirsch, Proc. U. S. Nat. Mus., **29**: 721.

Genus PHYLOBLATTA Handlirsch 1906.[10]

Phyloblatta pennsylvanica, sp. nov. Fig. 6.

Tegmen: length, 20 mm.; width, 10 mm.; costal area broad; Sc terminating beyond mid-wing; R well developed, no distinct R1; last branches of R terminating at the very apex; M sending 2 branches

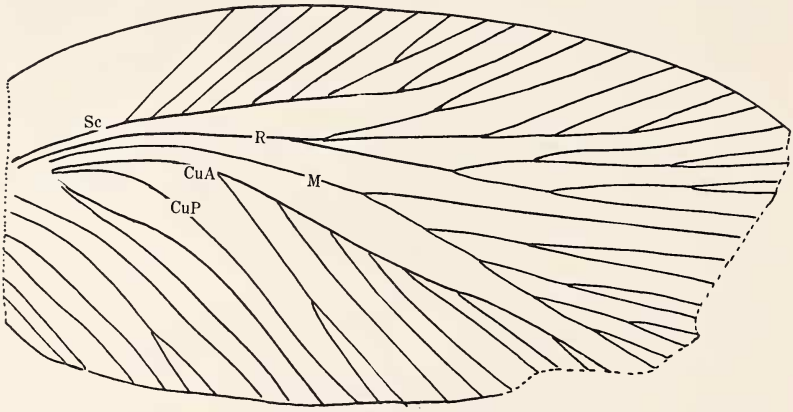

FIG. 6. *Phyloblatta pennsylvanica*, sp. nov., fore wing; drawn from holotype.

anteriorly; CuA well developed, the basal branches very long; CuP curved at base but nearly straight beyond; 1A distinctly forked.

The large genus *Phyloblatta*, which includes a great number of species from the coal beds of West Virginia, has not previously been found in Pennsylvania. The present species is a characteristic species of the genus and resembles some of the West Virginia species so closely that it may eventually turn out to be identical with one of them.

Holotype: Carnegie Museum, No. 6902. Locality: East Good Spring Colliery, Mammoth vein; Freeport stage, Allegheny formation. The specimen is complete except for the very base and the tip of the wing.

Genus SCHIZOBLATTA 1906 Handlirsch.[11]

Schizoblatta pennsylvanica, sp. nov. Fig. 7.

Tegmen: length, 25 mm.; width, 9 mm.; rather slender; costal margin strongly curved; Sc terminating at about mid-wing; R without a distinct R1, the first branch of R arising well before the middle of the wing; M sending out the first branch at about mid-wing, the

[10]Handlirsch, Proc. U. S. Nat. Mus., **29**: 731.

[11]Handlirsch, Proc. U. S. Nat. Mus., **29**: 722.

branches of M directed more or less anteriorly; CuA very large, the first branches very long and arising close to the base of the wing: CuP joined to CuA at the base, smoothly curved.

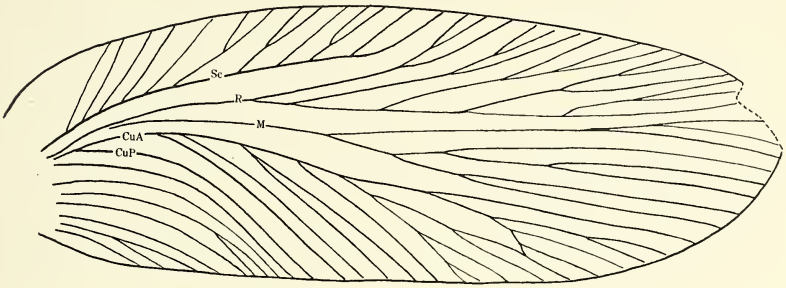

FIG. 7. *Schizoblatta pennsylvanica*, sp. nov., fore wing; drawn from holotype.

The genus Schizoblatta has previously been known only from one species, *S. alutacea* Handlirsch, from Ohio (Conemaugh). The present species is close to the latter, but is decidedly more elongate and has a larger CuA and a smaller R. There is a second tegmen in the Carnegie collection (No. 6904) which probably belongs here. The venation is very nearly the same as in the type, but the tegmen is much smaller and differently shaped. The latter indicates that tegmen belonged to an immature individual, hardly half-grown.

Holotype: Carnegie Museum No. 6903. Locality: Mammoth Vein, South Good Spring Colliery, Pennsylvania; Freeport stage, Allegheny formation. The specimen is complete and very well preserved.

Family SPILOBLATTINIDAE.

Genus SYSCIOBLATTA Handlirsch 1906.[12]

Syscioblatta allegheniensis, sp. nov. Fig. 8.

Tegmen: length of preserved part, 25 mm.; width, 9 mm.; slender and pointed; costal margin not very strongly arched; Sc terminating beyond the middle point of wing; R1 distinct and possessing numerous branches; Rs also well developed, arising proximad of mid-wing, with all branches anterior to the longitudinal axis of the wing; M not branching until distal of mid-wing, sending the branches anteriorly; CuA very well developed, prolonged distally and running parallel with the posterior margin for a short distance; CuP quite remote from the basal part of CuA as preserved in the fossil.

[12]Handlirsch, Proc. U. S. Nat. Mus., **29**: 760.

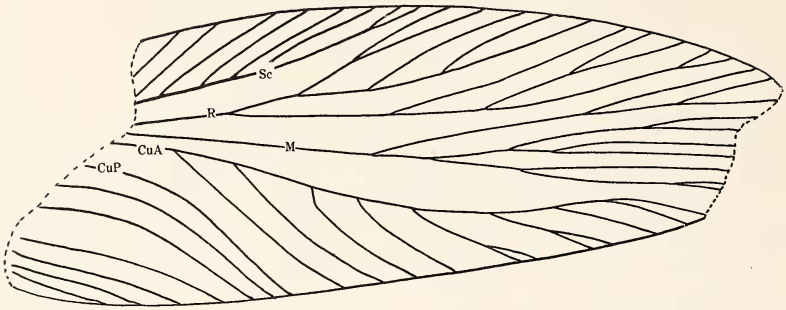

FIG. 8. *Syscioblatta allegheniensis*, sp. nov., fore wing; drawn from holotype.

The genus *Syscioblatta*, although well represented in the Carboniferous of Ohio and Kansas, and with one species (genotype) in the Carboniferous of Germany, has not previously been collected in Pennsylvania. This species and the following are very characteristic members of the genus. *S. allegheniensis* is distinguished from all other species by the very pointed tegmen.

Holotype: No. 3346 Museum of Comparative Zoology. Locality: Aspinwall, Pennsylvania, west side of Allegheny River (A. Emerson); Conemaugh formation. The specimen, which is finely preserved, is nearly complete, lacking only the very tip and part of the base of the tegmen.

Syscioblatta pennsylvanica, sp. nov. Fig. 9.

Tegmen: length of preserved part, 19 mm.; width, 8 mm.; rather broad; costal margin strongly curved; Sc terminating just beyond

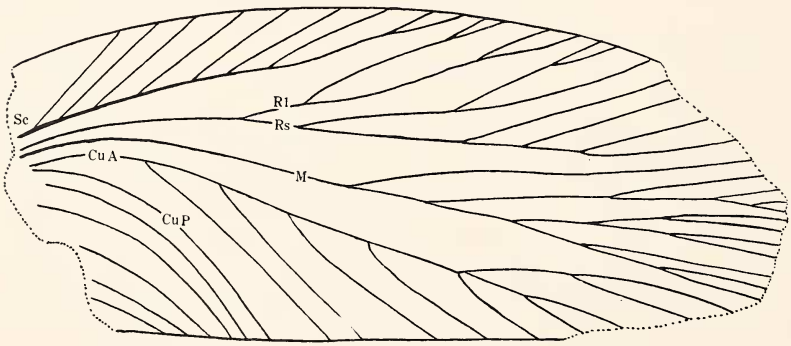

FIG. 9. *Syscioblatta pennsylvanica*, sp. nov., fore wing; drawn from holotype.

mid-wing; R1 distinct, but with fewer branches than in the foregoing species; all branches of Rs anterior of the longitudinal axis of wing; M directed posteriorly much more than in *S. allegheniensis*, the branches leading anteriorly; CuA well developed, with the distal part parallel with the posterior margin for a short distance; CuP uniformly curved.

This tegmen is close to the preceding, but differs in being proportionally broader, and in having the anterior margin much more strongly curved.

Holotype: Carnegie Museum, No. 6909. Locality: Duquesne Shale, Junction Hollow, Schenley Park, Pittsburgh, Pennsylvania; Conemaugh formation. The specimen is very well preserved, but lacks the apex and a small part of the base.

Family MYLACRIDAE.

Of the ten specimens of Mylacids in the material at hand only three are well enough preserved for generic determination. Some of the others may be identical with the three described below, but they do not show enough of the venation to enable us to assign them to any species.

Genus ACTINOMYLACRIS Handlirsch 1906.[13]

Actinomylacris similis, sp. nov. Fig. 10.

Tegmen: length of preserved part, 13 mm.; width, 7 mm.; Sc reduced to 3 branches, two of which are forked; Rs extending almost to the apex of the wing; M not branched until about mid-wing, its branches directed posteriorly; CuA narrow, the branches crowded,

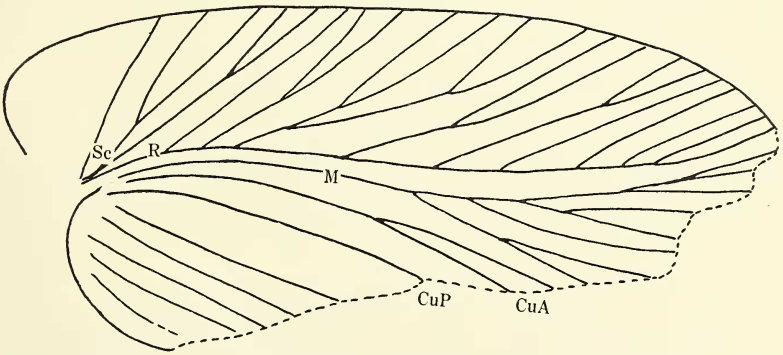

FIG. 10. *Actinomylacris similis*, sp. nov., fore wing; drawn from holotype.

[13]Handlirsch, Proc. U. S. Nat. Mus., **29**: 773.

the first branch arising close to base of wing; CuP straight for nearly its entire length; 1A remote from CuP.

This tegmen is very close to that of the other species of the genus, *A. carbonum* Scudder and *A. vicina* Handlirsch, the latter being from the Mammoth coal at Fremont. I was at first inclined to regard it as a small specimen of *A. vicina*, but it has a perfectly straight *vena dividens* (CuP), not a curved one, as in *A. vicina*, and the nature of that suture is probably one of the few structures in the cockroach tegmen that are constant.

Holotype: Carnegie Museum, No. 6907 and 6908. Locality: Mammoth vein, South Good Spring Colliery; Freeport stage, Allegheny formation. The specimen lacks the apex and most of the posterior margin.

Genus STENOMYLACRIS Handlirsch 1906.[14]

Stenomylacris emersoni, sp. nov. Fig. 11.

Tegmen: length, 25 mm.; width, 12 mm.; broad; distal branch of Sc terminating at about mid-wing; R very large, branching from the very base of the wing, but all branches anterior of the longitudinal axis of the wing; M also large branching near the base, the upper-

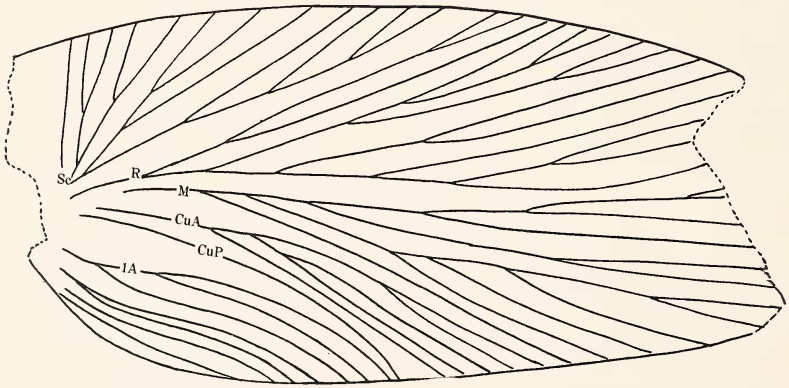

FIG. 11. *Stenomylacris emersoni*, sp. nov., fore wing; drawn from holotype.

most branches forming a straight line coinciding with the axis of the wing; CuA rather small, with only 3 main branches; CuP evenly curved; 1A remove from CuP basally, giving rise to 3 terminal branches.

[14]Handlirsch, Proc. U. S. Nat. Mus., **29**: 773.

This is only the second species of *Stenomylacris* which has been found, the other being *S. elegans* Handlirsch, from the Mammoth coal, near Fremont, Pennsylvania. *S. emersoni* differs from the genotype by having all branches of Rs anterior of the longitudinal axis of the wing, which is not true of *S. elegans* Handlirsch.

Holotype: No. 3347, Museum of Comparative Zoology. Locality: Aspinwall, Pennsylvania, west side of Allegheny River; Conemaugh formation; collected by Dr. Alfred Emerson, for whom the species is named. The fossil consists of a well preserved tegmen, lacking the very apex of the wing.

NEOSIMPLICIUS gen. nov.

Allied to *Simplicius* Handl. Sc radiate, but long; R without a distinct R1, possessing numerous branches which include the apical area of the wing; M greatly reduced, with only a few distal branches; CuA long, but with few branches; CuP joined to CuA near the base, slightly curved, and distinctly forked distally.

This remarkable genus is distinguished from all others of the Mylacridae by the reduced media and the fork on CuP as well as by the curious structure of CuA. The insect seems to be more closely related to *S. simplex*, from Danville, Illinois, than to any other genus, for in this also the media is reduced to a forked vein.

Genotype: *Neosimplicius medialis*, sp. nov.

Neosimplicius medialis, sp. nov. Fig. 12.

Tegmen: length, 20 mm.; width, 7 mm.; costal margin nearly straight, apex blunt; Sc extending far beyond mid-wing, all its branches arising from a single stem; R with at least 5 main branches, arising

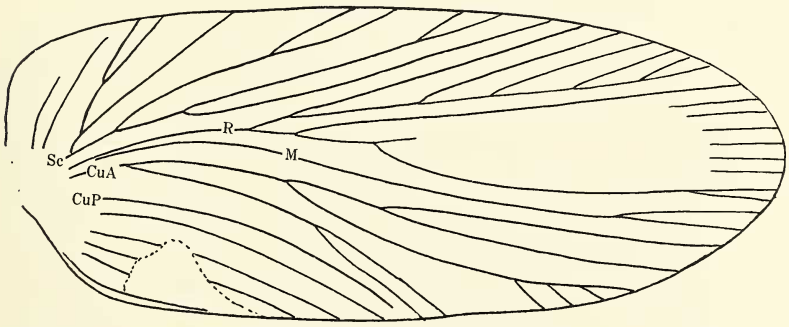

FIG. 12. *Neosimplicius medialis*, sp. nov., fore wing; drawn from holotype.

proximal of mid-wing; M slightly sinuate, with a single distal fork; CuA with a posterior branch arising before mid-wing and sending 3 short veinlets to the posterior margin; CuP forked to half its length; anal veins equidistant.

Holotype: Carnegie Museum, No. 6905 and 6906. Locality, Swatara Gap, Buck Mt. Coal vein, Sharp Mt., near Tremont, Pennsylvania, Clarion stage, Allegheny formation.

Family MESOBLATTINIDAE.

This highly specialized family, characterized by the absence or near absence of Sc, has been represented by only two species in the American Carboniferous, and both of these are in shales above the Ames Limestone, near Richmond, Ohio. I was much surprised, therefore, to find a typical specimen in the material collected by Dr. Emerson. Eventually, a new genus may be required for this species, but for the present I have placed it in a genus containing one of the Ohio species.

Genus ACMAEOBLATTA Handlirsch 1906.[15]

[15]Handlirsch, Proc. U. S. Nat. Mus., **29**: 793.

Acmaeoblatta carbonaria, sp. nov. Fig. 13.

Tegmen: length of preserved part 8 mm., whole length probably 9 mm.; width 3.7 mm. Sc absent. R well developed, some branches extending nearly to the apex of the wing; M fused with R basally, but curving towards the posterior margin soon after its origin; all branches of M directed anteriorly or at least apically; CuA small,

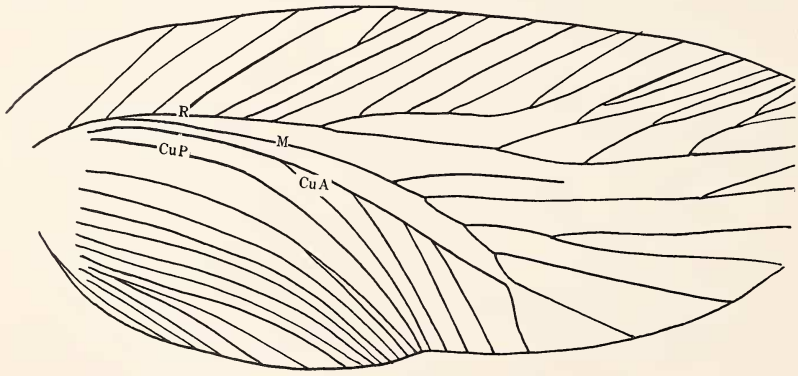

FIG. 13. *Acmaeoblatta carbonaria*, sp. nov.; fore wing; drawn from holotype.

sending 5 straight, parallel branches to the posterior margin and coalescing with M distally, forming a closed cell; anal area large; CuP uniformly curved.

This tegmen has all the characteristics of the Mesoblattinids, and in the coalescence of M and CuA is even more highly specialized than the other members of the family. In the specimen at hand the first branch of M apparently disappears into the wing membrane, but this is almost certainly an individual feature. The tegmen is strongly convex like that of most Mesoblattinids.

Holotype: No. 3348, Museum of Comparative Zoology. Locality: Aspinwall, Pennsylvania, west side of Allegheny River; Conemaugh formation; collected by Alfred Emerson. This specimen is well preserved and complete except for the very tip of the wing.

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